Remarks:

General:

The Applicant has amended the title, specification, claims, and abstract of Patent Application Number 09/784,773 to conform with the Office Action mailed April 2, 2002.

The laser diode arrays and other elements presented in this Amendment A are merely a clarification and expansion of intent and concepts presented in the original application and references (original and O.A.) and do not, in the view of the Applicant, constitute "new" technical material.

The term "SUBMILLIMETER IMAGE SWITCHES" is descriptive and not intended to be restrictive. A "submillimeter alphanumeric image switch" would also be a "submillimeter image switch". Static, submillimeter image switches would have unchanging symbols or scenes on the switching elements. Dynamic, submillimeter image switches would have the ability to change the symbols or scenes on the switching elements, e.g. liquid crystal switching elements and the like.

Current optronic/photonic system laser technology employs lasers with a wavelength of approximately 1.5 microns (10-6 meters). This would be the lower limit of submillimeter image switch resolution using current technology, i.e. information symbols or scenes on submillimeter image switch elements would be about 1.5 microns or larger in size (up to about 0.5 millimeters).

In a manner of speaking, motion picture projectors, still-slide projectors, TVs, displays (real/virtual), and the like, are image switching devices. These images can range from very large (I-Max) to very small (microdot). These projectors/screens can range from centimeters to meters in size.

In the Applicant's opinion, submillimeter image switching devices based on MEMS switches and laser diode arrays and the like (and the technology involved) are unique and novel devices, these are submillimeter switch elements and images, and centimeter sized devices. These submillimeter images would be machine operable and would need to be enlarged several times to be human observable.

A switch is commonly defined to have two possible states, either on or off. Submillimeter image switches expand the envelope of switch definitions. The submillimeter image switch embodiment described in "Objects and Advantages", with 256 switch elements would have 256 possible single states, or , if combinations are allowed, the possible number of states becomes very, very large. Such a device might be named an "optitch", for optical image switch.

References:

The red, blue and green color switching disclosed by Sakuma et al., U.S. Patent 6,292,305 B1, column 21, lines 3 - 64 et al., to create the illusion of a color image, does not appear to anticipate "SUBMILLIMETER IMAGE SWITCHES".

Tanaka et al., U.S. Patent 5,754,712 column 8, lines 37, 50 - 67 et al., apparently describes binary, on/off, switches and does not appear to anticipate "SUBMILLIMETER IMAGE SWITCHES".

"SUBMILLIMETER IMAGE SWITCHES" and the referenced articles and patents appear to describe all of the elements necessary to develop prototype information systems/networks of submillimeter image optronic/photonic devices.

The potential increase of information transfer rates by submillimeter image switches in optronic/photonic devices and/or systems/networks over binary code systems/networks would seem to make submillimeter image switch based optronic/photonic devices and/or systems/networks useful.

For Examiner's use only:

Marked up version of specification (excluding Claims and Abstract) in:

Amendment A of Application # 09/784,773.

[a marked up version with all of the original material of the specification of record underlined, and with deletions shown ~~deleted~~ as interline cross-outs; for the Examiner's use only.]

Title: ~~MINUSCULE IMAGES OF ALPHANUMERIC SYMBOLS~~ SUBMILLIMETER IMAGE SWITCHS

Background - Field of Invention:

[0001] This invention relates to switches and to the use of ~~alphanumeric~~ information symbols or scenes on MicroElectroMechanical System (MEMS) mirrors and/or on the exit mirrors of laser diode arrays and the like.

Background - Prior Art:

[0002] The use of binary switches and the resulting binary code have required that relatively long code strings be used to represent or transmit simple symbols.

[0003] Sakuma et al., U.S. Patent # 6,292,305 B1 disclose a virtual screen display apparatus and ... a relatively small image display for displaying characters or image information... [apparently of a size to be human observable] or "Means to create minuscule alphanumeric images by reflection and by/in the light pulse, for presentation on a real or virtual display screen" (from 2002, April 2 O.A.).

[0004] Lens systems to produce small images of varying magnification for detection by an electronic imaging system or "Lens systems for producing small images" (from 2002, April 2 O.A.) are disclosed by Betensky et al. (U.S. Patent 5,745,301).

[0005] An image processing apparatus for searching, storing, and displaying characters, sentence fragments, sentences or documents or "A device for searching any character string of a sentence input as an image" (from 2002, April 2 O.A.) is disclosed by Tanaka et al. (U.S. Patent 5,754,712).

[0006] An optical lens system and scanning device for reading and/or writing information in an information plane or "An optical scanning device for reading and writing information in an information plane" (from 2002, April 2 O.A.) is disclosed by Braat (U.S. Patent 6,317,276 B1).

[0007] The absolute/unique distinction between, the four patents referenced above (Sakuma et al., Betensky et al, Tanaka et al., and Braat) and "SUBMILLIMETER IMAGE SWITCHES", can be demonstrated by reference to Sakuma et al., U.S. Patent 6,292,305 B1, Sheet 15 of 20, FIG. 15. In the lower left corner of FIG. 15 is the term "IMAGE SIGNAL", to the left of that would be the purview of "SUBMILLIMETER IMAGE SWITCHES".

[0008] The same distinction would apply to the other three patents:

Tanaka et al., U.S. Patent 5,754,712, Sheet 1 of 23, FIG. 1, upper left, "IMAGE INPUT UNIT", above that would be the purview of "SUBMILLIMETER IMAGE SWITCHES".

Betensky et al., U.S. Patent 5,745,301, ABSTRACT, First sentence, "Variable power lens systems for use with electronic imaging systems, e.g. systems employing CCDs, are provided." , would be synergistic with the purview of "SUBMILLIMETER IMAGE SWITCHES".

Braat, U.S. Patent 6,317,276 B1, ABSTRACT, Last sentence, "This lens system is very suitable for a scanning device and an apparatus for reading/writing high-density optical discs." , would be synergistic with the purview of "SUBMILLIMETER IMAGE SWITCHES".

[0009] "SUBMILLIMETER IMAGE SWITCHES" would likely be synergistic with OCR equipment.

Objects and Advantages:

[0010] Submillimeter information, including scenes and/or alphanumeric symbols, on the mirrors of MEMS switches, and/or the exit mirrors of laser diode arrays and the like, allow the representation, switching and/or transmission of ~~symbol~~ submillimeter images with very short pulses of laser light.

[0011] One embodiment, an array of 256 submillimeter image switch elements (MEMS mirrors, laser diode arrays and the like) with submillimeter alphanumeric symbols on each switch element could function as an submillimeter alphanumeric image string switch.

[0012] The use of a, sequence label, in the switch address system would allow switching to any/all of the 256 image switch elements in any sequence, with each address operation. By including a, sequence plus time index label, the potential submillimeter alphanumeric image string can become extremely long for each address operation.

[0013] The advantage of submillimeter image switches would be the increased efficiency of directly switching, transmitting, manipulating, and storing information as submillimeter images of alphanumeric symbols or scenes, without the archaic conversion into binary code and the subsequent decoding.

Summary:

[0014] ~~Miniscule images, of alphanumeric~~ Submillimeter information symbols or scenes formed on MEMS mirrors and/or the exit mirrors of laser diode arrays and the like, allow these devices to function as submillimeter information image switches, producing a string of laser light pulses, each an image of a submillimeter information symbol or scene. These switches ~~are created for use~~ would be used in optronic/photonic devices and systems/networks.

Description:

[0015] Submillimeter information symbols or scenes, (reflective or ~~alphanumeric symbols~~ nonreflective, positive or negative), are etched or formed onto the mirrors of MEMS switches and/or the exit mirrors of laser diode arrays and the like (other optical switch devices including liquid crystal devices). By selectively switching which MEMS mirror reflects a laser light pulse or which laser diode emits a laser light pulse, these devices function as submillimeter image switches.

Operation:

[0016] A light pulse reflected or emitted from a submillimeter image ~~marked mirror~~ switch element would form an image of the symbol(s)/scene(s) ~~mirror~~ on that element. The light pulse image could be directed into an optical fiber for transmission. Projection of the light pulse image onto a CCD chip (or screen) would provide readout. ~~projection~~ Storage might be recording of the symbol image directly onto a CD (or with light stopping methods of Rowland Institute).

Conclusion, Ramifications and Scope:

[0017] The limiting factor may be the number of photons necessary to form an image. Many paths toward that limit appear possible: for example, extremely small symbols, extremely short light pulses, multiple symbols on each ~~mirror~~ switch element, lens systems, very high element number switches; i.e. current MEMS switches have 256 mirrors (possible symbols), frequency multiplexing; i.e. each frequency of the light pulse forming an image, and reflective symbols on a nonreflective background. Alternatively: symbols might be formed directly onto the exit mirrors of lasers such that the laser pulse, itself, is the image; or images created by passing the light pulse through an image medium. Eventually, a image may be worth a thousand bits.

[end of marked up version]

Comment: The Applicant wishes to convey appreciation and gratitude to the Examiner for diligence and assistance. Thank You!

Conclusion:

In the view of the Applicant, the above Amendment A in Patent Application Number 09/784,773 conforms to the 2002, April 2 Office Action.

Request For Constructive Assistance:

The Applicant requests, with all due respect, the assistance and suggestions of the Examiner, pursuant to M.P.E.P. | 2173.02 and | 707.07(j), to place this Application (# 09/784,773) in allowance.

Very Respectfully:

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Certificate of Mailing

I hereby certify that this Amendment A in Patent Application Number 09/784,773 and referenced attachments will be deposited with the U.S. Postal Service by Express Mail, in an envelope addressed to "Box Non-Fee Amendments, Commissioner for Patents, Washington, DC 20231" on the date below.

Date: May 15, 2002

Inventor's Signature: Joseph D. Udy